# DAQ/Electronics Update

Leon Mualem
University of Minnesota

# DAQ/Electronics Personnel

- APD Module (UMN, IU) Roger Rusack, Tom Chase, Stuart Mufson, Jon Urheim, Walt Fox, Gerard Visser, Leon Mualem
- FEB (Harvard) John Oliver, Nathan Felt, Sarah Harder
- Power Distribution (UVa) Craig Dukes, Ken Nelson, Andrew Norman, Harvey Sugarman
- Power Removal (UMN) Bill Gilbert
- DAQ Hardware (FNAL) Vince Pavlicek, Rick Kwarciany, Bill Haynes
- DAQ Software (FNAL) Jerry Guglielmo, Kurt Biery
- DAQ integration (FNAL) Margaret Votava
- Detector Control System (UVa) Andrew Norman

- My apologies to anyone I missed

# APD Module

- APD--See Roger's Talk up next
- Testing of Indiana Thermal/Mechanical prototypes continues
  - Critical for determining system heat load
  - Developing design for production module
  - See Jon Urheim's talk Friday (and yesterday)
  - More design required, but moving forward

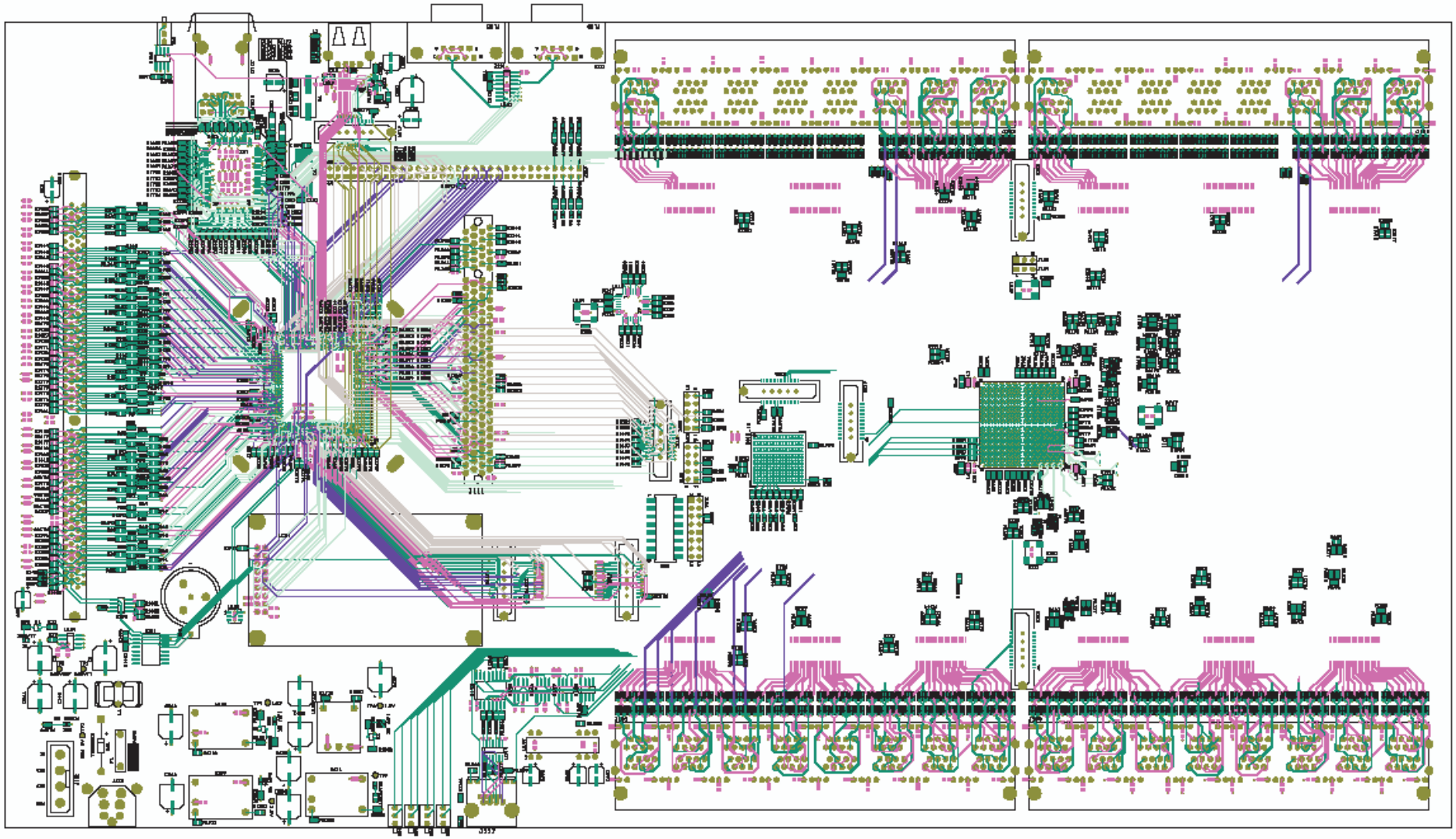
# Front-End Board

- Standalone ASIC tests completed by Tom Zimmerman
  - Excellent performance bare chip tested at 110electrons RMS, simulated to be 150.
  - Packaging decided
  - Will be tested on the next prototype readout board
- Schematic design for version P2.0 of the FEB was developed in July.
  - This version will contain the following features.
    - ChipIdeas quad ADC which was tested under P1.0
    - TEC control circuit as supplied by Gerard Visser
    - On board FPGA controller with Cypress USB interface chip
    - Interface cable to APD module
- These boards are intended to service and read out multiple APD modules and NOvA detectors.

# Data Concentrator Module Prototype Development Status

- Schematic is complete and has passed an internal review.
- PC board layout is well under way.  Parts are placed and routing is about 70% complete.
- Parts for five boards have been ordered. About a third of the parts have arrived.
- Software and firmware development not yet started.

# Data Combiner Module (In Progress)



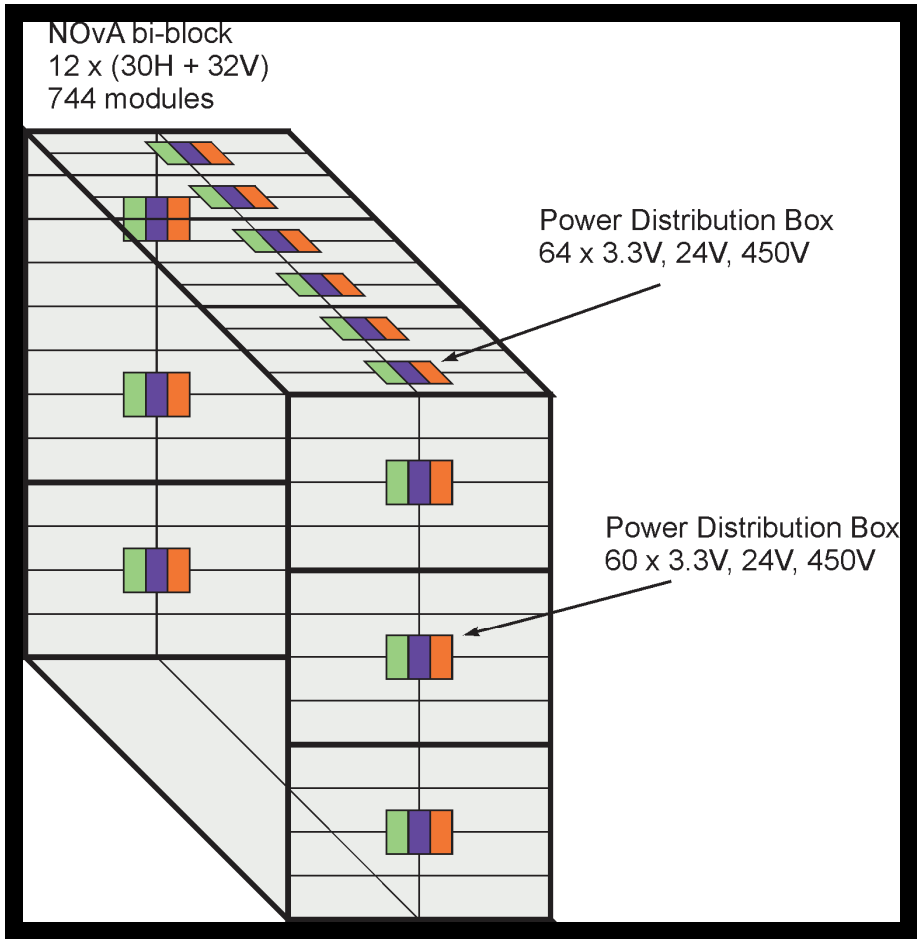
# GPS Based Timing System

- The GPS based Timing System consist of:
  - One GPS synchronized master distribution box
    - 32.768Mhz GPS synchronous clock generator
    - Interfaced to the run control host
    - Distributes timing to 24 DCMs
  - 10 Slave distribution boxes
    - Evenly spaced along the backbone of the detector
    - Distributes timing to 24 DCMs
- Timing distribution system implementations being considered
  - Unidirectional timing distribution
  - Bidirectional timing distribution

# Number of Power Distribution Boxes

**NOvA Electronics Power Supply Requirements**

| **Detector Size (kt)** | **20** | **25** | **30** |
|---|---|---|---|
| Blocks | 44 | 54 | 66 |
| Modules/plane | 12 | 12 | 12 |
| Horizonatal planes/block | 15 | 15 | 15 |
| Vertical planes/block | 16 | 16 | 16 |
| Planes/bock | 31 | 31 | 31 |
| Modules (FEBs)/block | 372 | 372 | 372 |
| PDBs (DCMs)/block | 6 | 6 | 6 |
| | | | |
| Total fibers | 523,776 | 642,816 | 785,664 |
| Total modules (FEBs) | 16,368 | 20,088 | 24,552 |
| **Total PDBs (DCMs)** | **264** | **324** | **396** |
| | | | |
| PDBs/HV channel | 2 | 2 | 2 |
| HV channels (CAEN) | 132 | 162 | 198 |
| HV cards (CAEN) | 11 | 14 | 17 |
| HV cards/mainfraime | 8 | 8 | 8 |
| **HV mainframes (CAEN)** | **1** | **2** | **2** |
| | | | |
| PDBs/3.3V channel | 1 | 1 | 1 |
| 3.3V channels (Weiner) | 264 | 324 | 396 |
| 3.3V channels/mainframe | 3 | 3 | 3 |
| **3.3V mainframes** | **88** | **108** | **132** |
| PDBs/24V channel | 1 | 1 | 1 |
| 24V channels (Weiner) | 264 | 324 | 396 |
| 24V channels/mainframe | 3 | 3 | 3 |
| **24V mainframes** | **88** | **108** | **132** |



# Detector Control Systems

- Lots of investigations
  - UVa, Andrew Norman, looked at many different systems
  - Found some compelling features in EPICS
  - Seriously investigating this
  - Bologna, Niccolo Moggi, also investigating, evaluating solutions, will report soon.

# Future

- Designs maturing
  - specification of components allows us to move on to mechanical design, installation, infrastructure requirements.
- Still need work on Open Plan cost and schedule, revisit costs, TDR, ….